

REMARKS

Claims 1-4 and 13-30 are pending in this application. By this amendment, non-elected claims 5-12 have been cancelled without prejudice or disclaimer. Additionally, claims 1, 4 and 13-16 have been amended and claims 17-30 are added. Support for new claims 17-30 can be found in the original specification, including the claims and the figures. For example, see page 3, lines 23-30, page 5, lines 2-4 and page 7, lines 4-18. Support for amended claim 4 can be found at page 6, lines 3-13 and page 7, lines 27-33, for example. Reconsideration in view of the above amendments and following remarks is respectfully requested.

1. 35 U.S.C. §102(e) and 35 U.S.C. §103(a)

The Office Action rejects claims 1-4 and 13-16 under 35 U.S.C. §102(e) as being anticipated by, or in the alternative, under 35 U.S.C. §103(a) as being obvious over *Dodelet et al.* (U.S. Patent No. 6,887,451, hereinafter referred to as "*Dodelet*"). Claims 4 and 16 have been cancelled without prejudice or disclaimer, therefore the rejection of these claims is moot. The rejection of the remaining claims is respectfully traversed.

Claim 1 has been amended to incorporate recitations of dependent claim 4.

The Office Action states on page 2 that:

With respect to claim 4, it is the position of the examiner that such properties of said material are inherent, given that the nanotubes disclosed by *Dodelet et al.* and the present application are prepared by the same procedure, i.e., chemical vapor deposition.

See page 2 of the Office Action dated February 21, 2006.

However, *Dodelet* specifically discloses "nanotubes [that] are quite straight and very clean." See col. 3, lines 55-56 (emphasis added). Therefore, *Dodelet*

clearly does not disclose, suggest, or imply forming carbon nanotubes that are branched off. Rather, *Dodelet* implies that branched carbon nanotubes would be outside their "straight and very clean" nanotubes.

Additionally, contrary to the Office Action's position that "Dodelet et al. and the present application are prepared by the same procedure" *Dodelet* discloses:

The carbon paper 1 is first heated to 400° C. in an argon atmosphere to decompose the nitrates and produce oxidized metals. A reduction to obtain metal nanoparticles is then carried out in the presence of hydrogen at about 500° C. for 2 to 3 minutes. The paper 1 is then heated to about 800° C. and a gas mixture including 90% Ar, 5% H₂ and 5% C₂H₄ is fed into the tube 3. The gas mixture is forced to pass through the 1.3 cmx1.3 cm active section of carbon paper 1 before exiting the tube. Multi-wall carbon nanotubes (MWCNTs) are rapidly generated on the carbon paper 1, and their growth stops after about one minute. Finally, the system is cooled under an argon atmosphere.

See *Dodelet*, col. 3, lines 6-17. On the other hand, the present application specifically recites, for example, that:

In a method for fabricating carbon nanotubes according to certain embodiments of the present invention, after uniformly dispersing metallic catalyst particles over a carbon substrate, as illustrated in (a) of FIG. 6, carbon source gas is supplied at a constant rate under atmospheric pressure and reacted at 400-900°C for 1-120 minutes to grow carbon nanotubes over the carbon substrate, as illustrated in (b) of FIG. 6. When the carbon nanotubes grow to some extent, as illustrated in (c) of FIG. 6, hydrogen gas or ammonia gas may be applied to fabricate branched carbon nanotubes, as illustrated in (d) of FIG. 6. While carbon nanotubes grow, most metallic catalyst particles adsorb onto the internal and external walls of the carbon nanotubes. However, some metallic catalyst particles may act as nuclei from which the carbon nanotubes branch off when subjected to etching using reducing gas, such as hydrogen gas or ammonia gas. Therefore, the branched carbon nanotubes according to certain embodiments of the present invention can be fabricated. In particular, hydrogen gas converts metallic catalyst particles in oxidized form into reduced form, thereby increasing the activity of the catalyst particles and leading to the growth of branched carbon nanotubes.

See page 5, line 28 to page 6, line 13 (as modified above). As evidenced by the exemplary method described in the specification, Applicants submit that the nanotubes disclosed by *Dodelet* are not prepared by the same exemplary procedure as disclosed in the present application and therefore the properties of the carbon nanotubes being branched is not inherent. In fact, *Dodelet* expressly states that its nanotubes are "quite straight," which clearly indicates they are not branched.

For at least the reasons set forth above, Applicants respectfully submit that claim 1 is allowable. Claims 2, 3 and 13-15 depend from claim 1, and are allowable for at least the same reasons. Withdrawal of the rejection is respectfully requested.

One object of certain embodiments of the present invention is to provide CNTs for use in a fuel cell. The metallic catalyst particles doped in the CNTs for use in a fuel cell of various embodiments of the present invention function as both a catalyst for growing the CNTs and a catalyst for the fuel cell. It is also preferable that the CNTs are branched in order to increase a surface area of the CNTs and a degree of distribution of the metallic catalyst particles. Hence, claim 4 is separately patentable for at least this reason.

Further, the metallic catalyst particles are not removed after growth of the CNTs. In contrast, the main object of *Dodelet* is to provide an improved process for producing CNTs which are relatively free of defects and amorphous carbon. *Dodelet* teaches removing a metal catalyst for growing CNTs as an impurity (see claim 2 of *Dodelet*). Therefore, *Dodelet* cannot provide any motivation to invent the CNTs for use in a fuel cell.

2. New Claims

As mentioned above, claims 17-30 have been added to the application.

Applicants respectfully submit that for at least the reasons set forth above, new independent claims 17 and 23 are allowable. Additionally, claims 18-22 depend from claim 17, and claims 24-30 depend from claim 23, and are allowable for at least the same reasons. Allowance of all pending claims is respectfully requested.

3. Conclusion

Applicants invite the Examiner to contact Applicants' representative at the telephone number listed below if any issues remain in this matter, or if a discussion regarding any portion of the application is desired by the Examiner.

In the event that this paper is not timely filed within the currently set shortened statutory period, Applicants respectfully petition for an appropriate extension of time. The fees for such extension of time may be charged to our Deposit Account No. 02-4800.

In the event that any additional fees are due with this paper, please charge our Deposit Account No. 02-4800.

Respectfully submitted,

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